Claim 30 (New): The mobile unit of claim 27, wherein each of the first and second spreading codes is an Orthogonal Variable Spreading Factor (OVSF) code selected from a code-tree.

Claim 31 (New): The mobile unit of claim 30, wherein the second code has a spreading factor greater than or equal to 256.

REMARKS

Claims 1-14 and 17-31 are now pending in the application, with claims 1 and 9-11 having been previously withdrawn. Claim 21 has been amended to correct a spelling error, and new claims 22-31 added without introduction of new matter. Favorable reconsideration is respectfully requested in view of the above amendments and the following remarks.

Claims 2-7, 12-14, and 17-21 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Umeda et al. (U.S. Patent No. 5,420,850). This rejection is respectfully traversed.

The various embodiments all relate to interference estimation in a Code Division Multiple Access (CDMA) communication system. In such a system, interfering signals are allowed to share the same frequency at the same time. This is achieved by, on the transmitter side, multiplying each signal with a unique spreading code sequence. The signals are then scrambled and transmitted on the common channel in overlapping fashion as a composite signal. Each mobile receiver correlates the composite signal with a respective unique despreading code sequence to thereby extract the signal addressed to it. See, for example, pages 1-2 in Applicant's specification.

One characteristic of such a system is that signals that are not addressed to a mobile receiver assume the role of interference. To achieve reliable reception of a signal, the ratio of the signal to the interference should be above a prescribed threshold for each mobile station (referred to as a required signal-to-interference ratio, or SIR_{req}). Being able to accurately measure the level of interference that occurs concurrently with the desired signal is, therefore, very important in CDMA systems because that measurement forms the basis for any of a number of different power control mechanisms that are employed to make sure that each

signal contributing to the composite signal is transmitted at neither too strong nor too weak a power level.

The Background section of Applicant's disclosure describes a number of known techniques for measuring the interference. One of these, referred to as "a third method", is described on page 6, lines 16-24 as follows:

> A third method ... involves correlating the received signal with the channelization code allocated to the connection during a time when nothing is being transmitted to the mobile station. Since there is no "wanted" signal, despreading the received signal would then yield a good estimate of the interference. A problem with this approach is that the mobile station has to know when no information is being transmitted to it. This could be solved by having predetermined time-instants of no transmission, but such a solution has a certain capacity loss, since the interference measurement would need to be updated quite regularly.

Applicant's methods and apparatuses for estimating interference take an entirely different approach. In embodiments defined by independent claim 2, a method for estimating interference comprises the steps of "*reserving at least one code in a set of codes for interference measurement only*; receiving a composite signal; and *estimating said interference at a receiver using said at least one reserved code*." [Emphasis added.]

Independent claim 5 defines a mobile station that comprises: "a receiver for receiving a signal over an air interface and despreading said signal using at least one channelization code; [and] a processor for providing said at least one channelization code to said receiver, *said at least one channelization code including a reserved code that is used only to estimate interference associated with said received signal.*" [Emphasis added.]

And, in embodiments defined by independent claim 21, a method for estimating interference in a system comprising a transmitter and a receiver comprises "*reserving at least one code in a set of codes for interference measurement only, wherein the reserved at least one code is used within the system only to despread received signals and not to encode signals for transmission*; transmitting a signal; receiving the signal; and *estimating*

interference at the receiver by despreading the received composite signal using the at least one reserved code." [Emphasis added.]

It is well known that "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). In the present instance, none of independent claims 2, 5 and 21 are anticipated by Umeda et al. at least because Umeda et al. fail to disclose or even suggest reserving at least one code in a set of codes for interference measurement only, and then using that reserved code to estimate interference in the composite signal.

Instead, Umeda et al. disclose a technique in which the same code is used to both obtain the desired information, and to estimate the interference. This is made quite clear in Umeda et al. at, for example, column 7, lines 19-63, which begins by "supposing that the power of the overall interference signal component in the overall received signal despread every period T_p (i.e. the output from the correlation detector 22) is distributed uniformly throughout one cycle period T_p and that the power of the desired signal (i.e. the received signal in the control channel under measurement) mostly concentrates in the window...."

On this basis, Umeda et al. estimate the interference as follows: The total signal power P_W in the window a-b after despreading is determined in accordance with the integral shown in Equation (1). The window a-b is illustrated in Figure 3 and also in Figure 6A. It can be seen that this is the time interval during which the correlation between the code and the received signal is at its peak; thus the power accumulated during this interval includes power associated with the desired information, as well as power associated with interference.

Next, the total interference signal power P_I distributed outside the window after despreading is determined in accordance with the integral shown in Equation (2). The intervals of integration 0-a and b-T_p are shown in Figure 6A. It can be seen that this is the time interval during which the correlation between the code and the received signal is at its minimum; thus the power accumulated during this interval is assumed to represent power associated only with interference.

It should now be recognized that the measurement P_I cannot, itself, be taken as the desired measure of interference because the time duration of this measurement far exceeds the time duration of the window during which the desired information is present. Umeda et al. solve this problem by relying on their initial assumption that "power of the overall

interference signal component in the overall received signal despread every period T_p ...is distributed uniformly throughout one cycle period T_p and that the power of the desired signal (i.e. the received signal in the control channel under measurement) mostly concentrates in the window". On this basis, they determine the ratio (W/T_P) of the width W of the window a-b to the period T_P (with $W<<T_P$), and then assume that this fraction multiplied by the power accumulated outside the window (i.e., P_I) is a good approximation of the power of the interference signal component within the window. See Umeda et al. at col. 7, lines 46-55.

Thus, Umeda et al. describe an approach to interference measurement that is at least similar to the "third method" described in the Background section of Applicant's disclosure in that a code normally used for obtaining the desired information from a signal is also used to despread the signal at a time when it is assumed that no information is being transmitted.

It should now be readily apparent that the Umeda et al. patent does not anticipate Applicant's claimed invention because Umeda et al. do not "reserve" any code "for interference measurement only." Instead, Umeda et al. use the same code for both extracting the desired information and performing interference measurement.

Arguments along these lines have been presented to the Office before in connection with the rejection of Applicant's claims over the Umeda et al. patent. With respect to claims 2, 4-7, and 12-13, in the "Response to Arguments" section of the June 25, 2004 Office Action, the Office merely quoted the opening line out of Applicant's four-page argument and stated "It is unclear which claim the applicant is referring to, but Claim 2 or 5 do not require such limitation." It is not understood why the Office chose to ignore other express statements in that earlier-filed response, such as:

- "Accordingly, Umeda fails to disclose or suggest estimating interference by reserving at least one code in a set of codes for interference measurement only, receiving a composite signal, and estimating said interference at a receiver using said at least one reserved code, as recited in Claim 2;" and
- "Umeda likewise fails to disclose or suggest a mobile station including a receiver for receiving a signal over an air interface and despreading the signal using at least one channelization code, and a processor for providing the at least one channelization code to the receiver, the at least one channelization code including a reserved code that is used only to estimate interference associated with the received signal, as recited in Claim 5,"

both of which statements appear on page 9 of Applicant's June 7, 2004 response. Should the Office choose to again reject these claims over the Umeda et al. patent, it is hoped that greater attention will be paid to the entirety of Applicant's arguments, and that the Office will point out with particularity exactly where Umeda et al. disclose, for example, "reserving" a code "for interference measurement only," as recited in Applicant's claims.

With respect to claim 21, the Office states that it "requires that 'the reserved at least one code ... not to encode signals for transmission'. The mobile transmit signals using assign traffic PN code and not the 'reserved PN code' for the control channels." This response is unpersuasive because reserving a PN code for control channels is not the same as "reserving at least one code in a set of codes for interference measurement only, ..." as expressly stated in claim 21. The PN code for control channels cannot be considered "reserved ... for interference measurement only" because, as explained more fully above, the mobile terminal in Umeda et al. uses that same PN code for both receiving the control channel and also for interference measurement. To use that PN code for receiving the control channel, it must also have been used for encoding signals for transmission of the control channel.

For at least the foregoing reasons, independent claims 2, 5 and 21 are believed to be patentably distinguishable over the Umeda et al. patent. The claims 3-4, 6-7, 12-14, and 17-20, which variously depend from one or the other of independent claims 2 and 5, are patentable at least for the same reasons, as well as for other features that they recite which are not disclosed by Umeda et al. Accordingly, it is respectfully requested that the rejection of claims 2-7, 12-14, and 17-21 under Section 102(b) be withdrawn.

Claim 8 was rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Umeda et al. (U.S. Patent No. 5,420,850) in view of Kato et al. (U.S. Patent No. 5,583,851). This rejection is respectfully traversed.

Claim 8 depends indirectly from independent claim 5, and is therefore patentable over the Umeda et al. patent for at least the reasons set forth above with respect to that base claim. The Kato et al. patent discloses a mobile communication unit which can perform a high-bit rate information transmission by allocating a plurality of channel numbers to a user who carries out a high-bit rate communication. However, the Kato et al. patent does not disclose any technique for measuring interference, and therefore fails to make up for the deficiencies of Umeda et al.

In view of the above, it is believed that claim 8 is patentably distinguishable over Umeda et al. and Kato et al., regardless of whether these references are considered individually or in combination. Accordingly, it is respectfully requested that the rejection of claim 8 under Section 103 be withdrawn.

New claims 21-31 have been added without introduction of new matter. These claims variously define embodiments in which a composite signal that includes a transmitted signal representing a data stream that has been spread by means of a first spreading code is received. The first spreading code is used to despread the composite signal and thereby retrieve the transmitted signal; and interference is estimated at the receiver by using a second spreading code to despread the composite signal, wherein the estimated interference represents interference that occurred during that part of the composite signal that includes the data stream. These claims further require that "the second spreading code is reserved for interference measurement, whereby a probability that the composite signal includes a transmitted signal representing a data stream that has been spread by means of the second spreading code is low enough to permit the interference at the receiver to be reliably estimated."

These new claims are believed to be patentably distinguishable over the prior art of record at least for the same reasons as presented above with respect to claims 2-8, 12-14, and 17-21.

The application is believed to be in condition for allowance. Prompt notice of same is respectfully requested.

Respectfully submitted,
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